

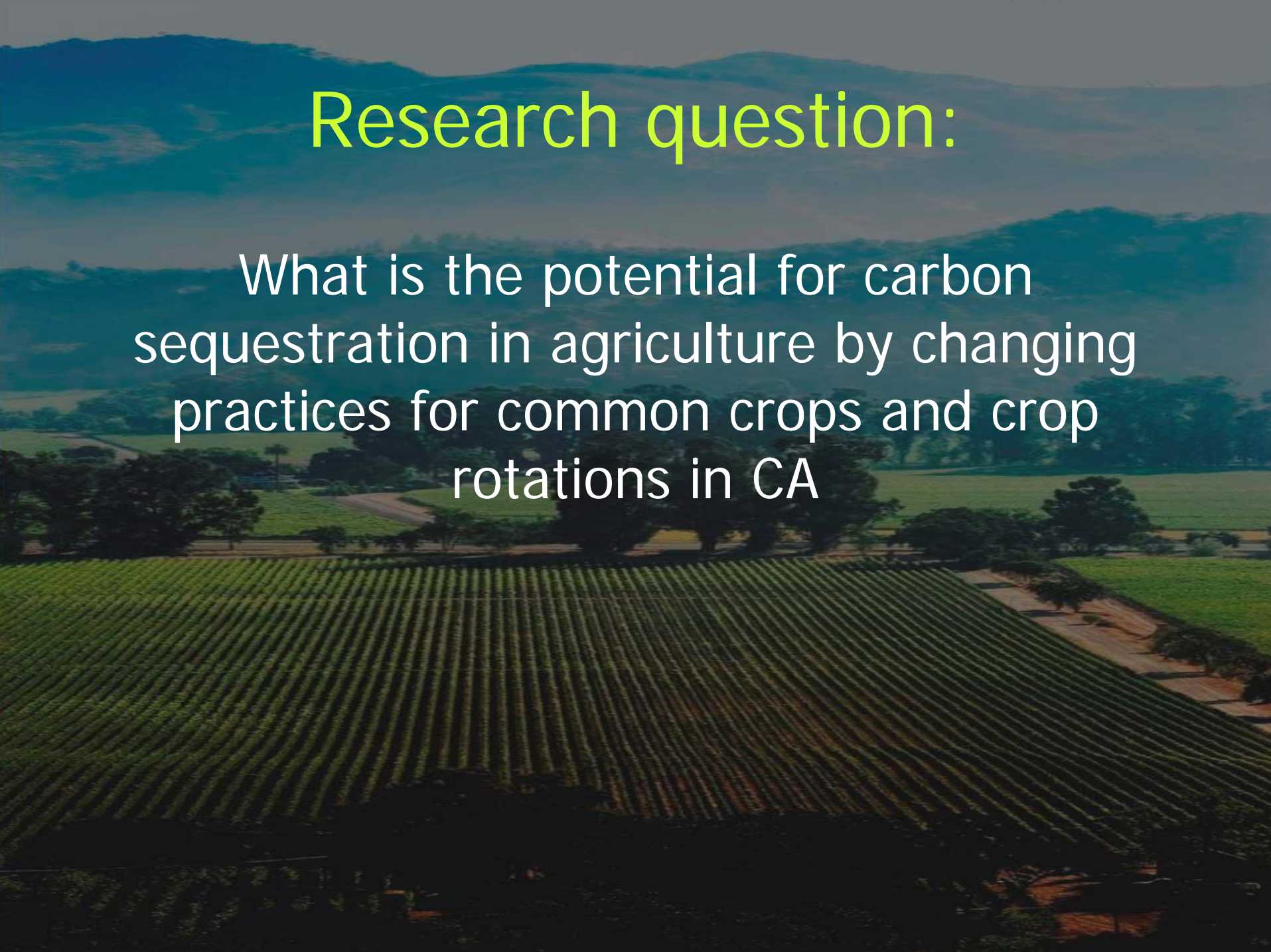
Regional Estimates of Greenhouse Gas Mitigation Potentials by Adopting Alternative Farming Management Practices in California

Steven De Gryze, Richard Howitt,
and Johan Six



Research question:

What is the potential for carbon sequestration in agriculture by changing practices for common crops and crop rotations in CA

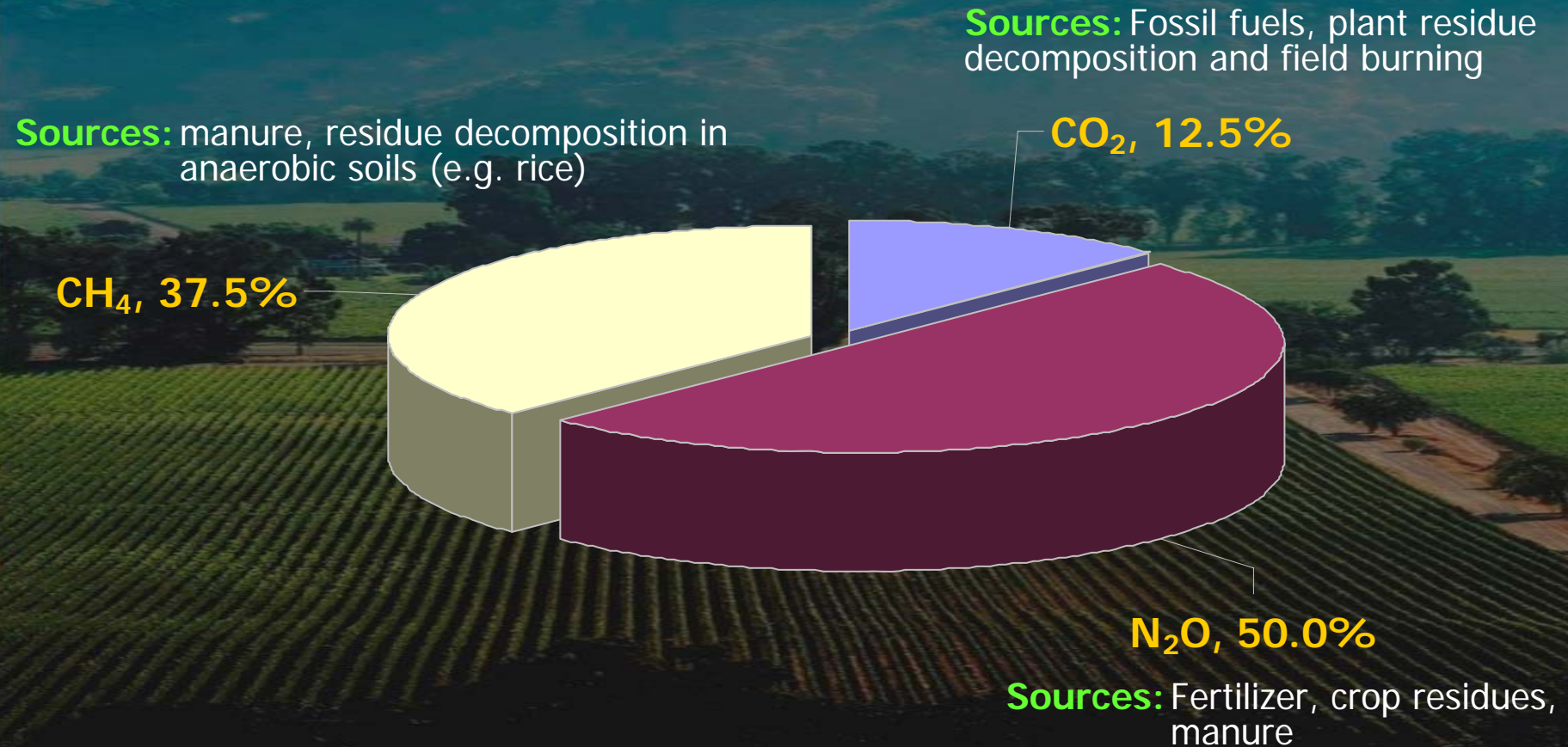


Research question:

What is the **potential for carbon sequestration** in agriculture by changing practices for common crops and crop rotations in CA

= total emissions under alternative practices
– total emissions under conventional practices

Biogenic GHGs



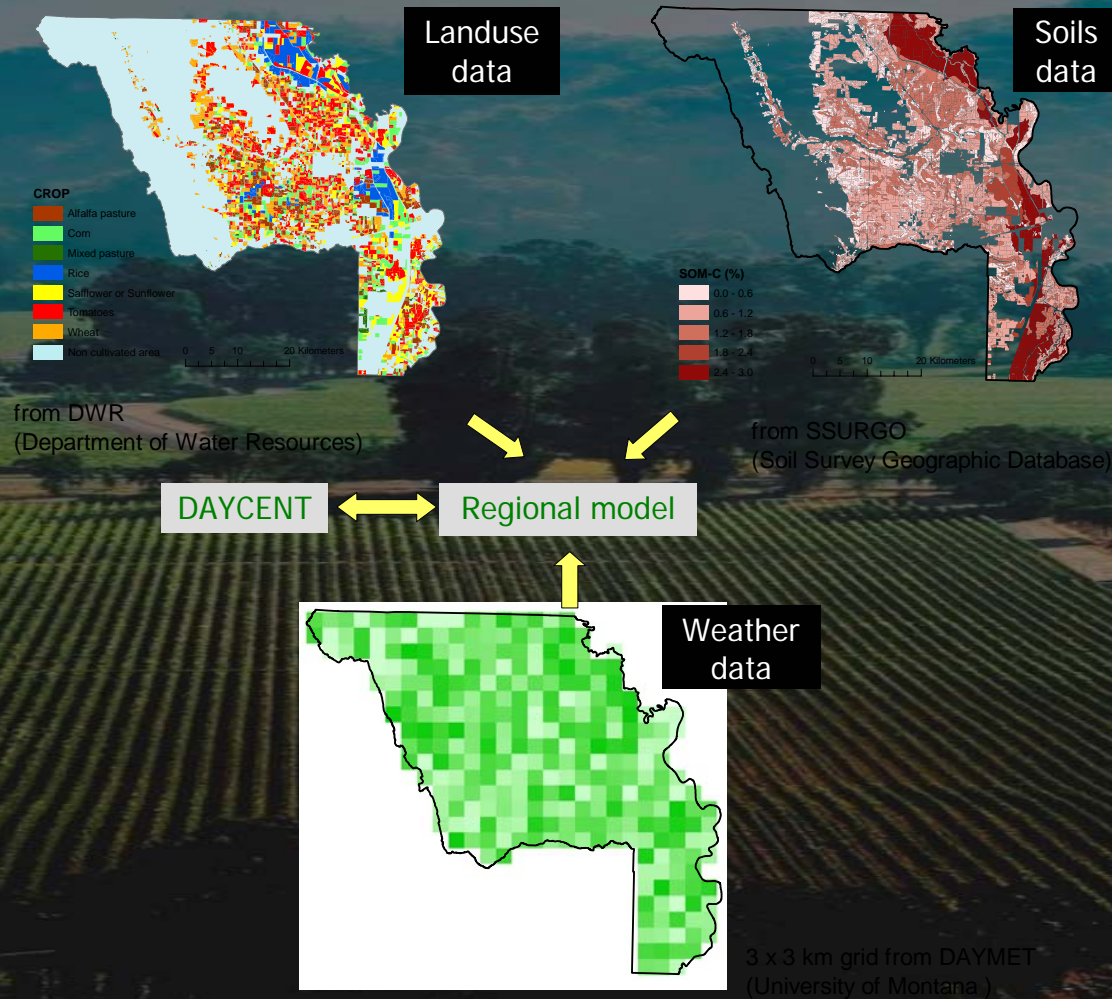
Practices for C sequestration

- Any practice which
 - **Increases soil C**
 - Non-soil C pools (litter,...) are not considered true sequestration
 - Not permanent
 - **Reduces emissions** of N_2O or CH_4
 - permanent

Practices for C sequestration

- Conservation tillage
 - Reducing the number of tillage passes
- Winter cover crops
 - Growing a second crop (e.g. legume) over the winter
- Organic agriculture
 - Cover cropping and manure use

Methodology



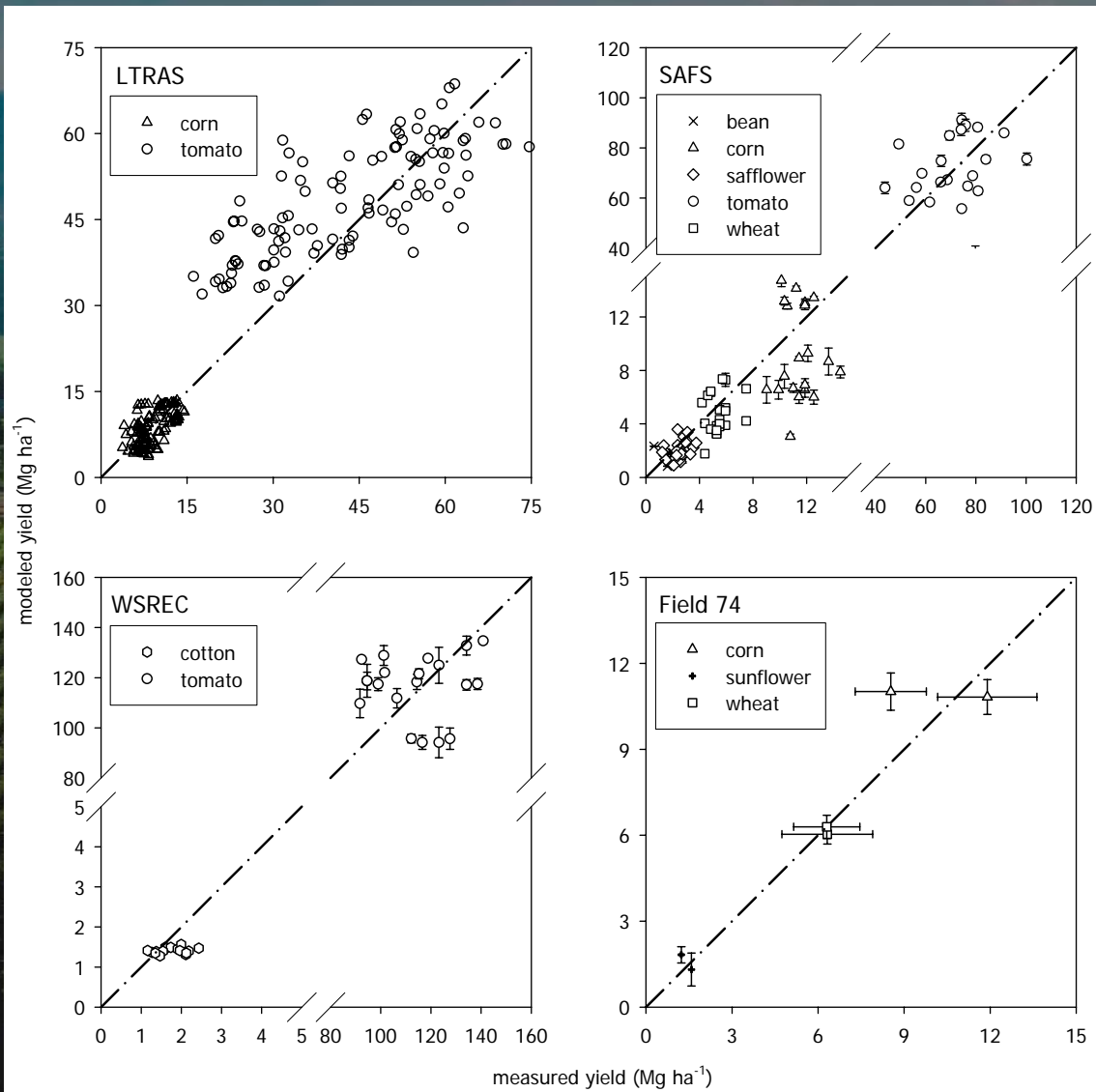
Methodology

- Crops were modeled in their **typical rotations**
- **Management data** from cost and return studies and farmer's survey, typical for Sacramento Valley

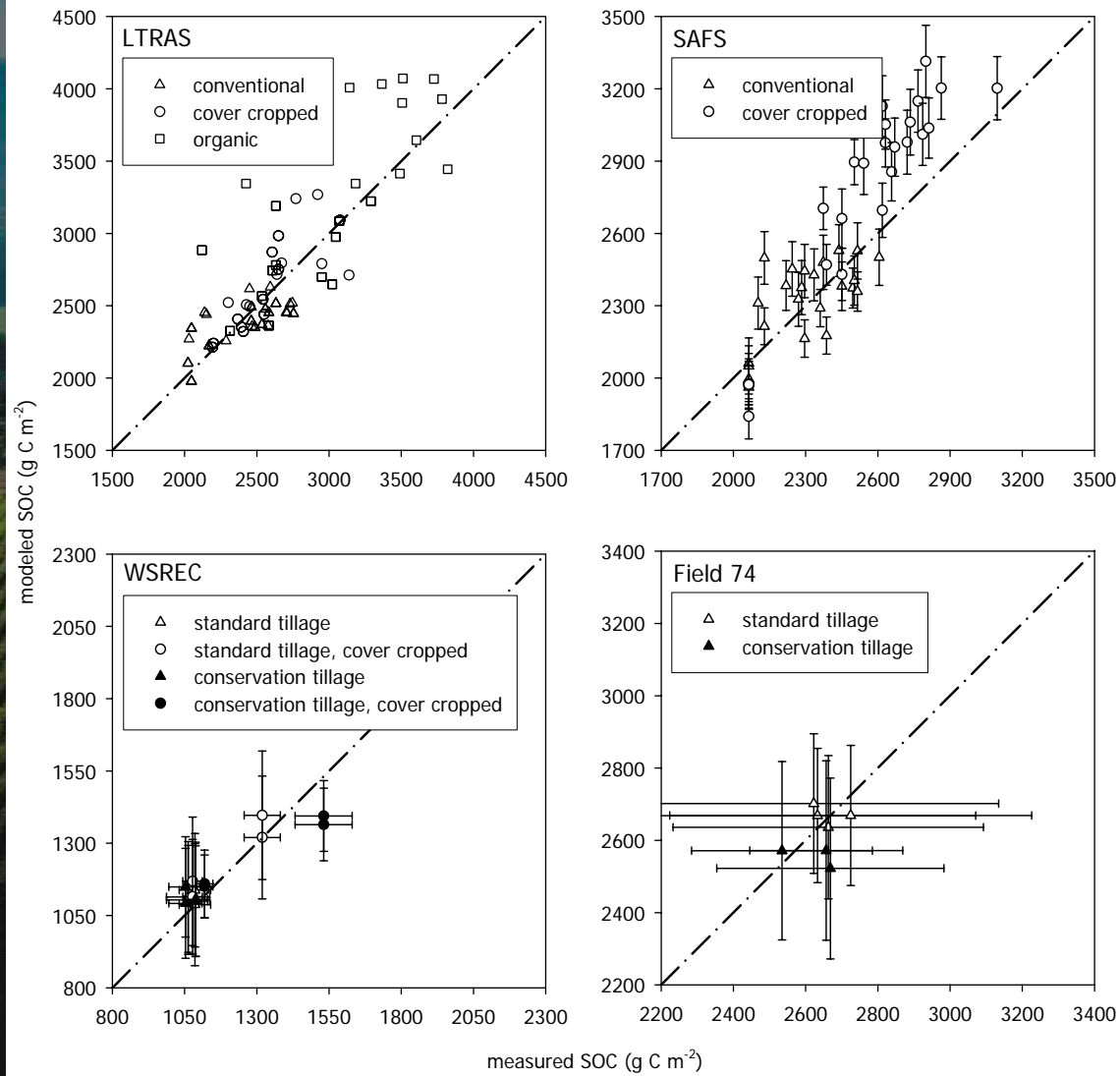
Site validation

- 4 long term experiments
 - Sacramento Valley
 - LTRAS, SAFS, Field 74
 - San Joaquin Valley
 - WSREC
- Reduced tillage, winter cover cropping, organic practices
- Cotton, tomato, corn, beans, wheat, sunflower

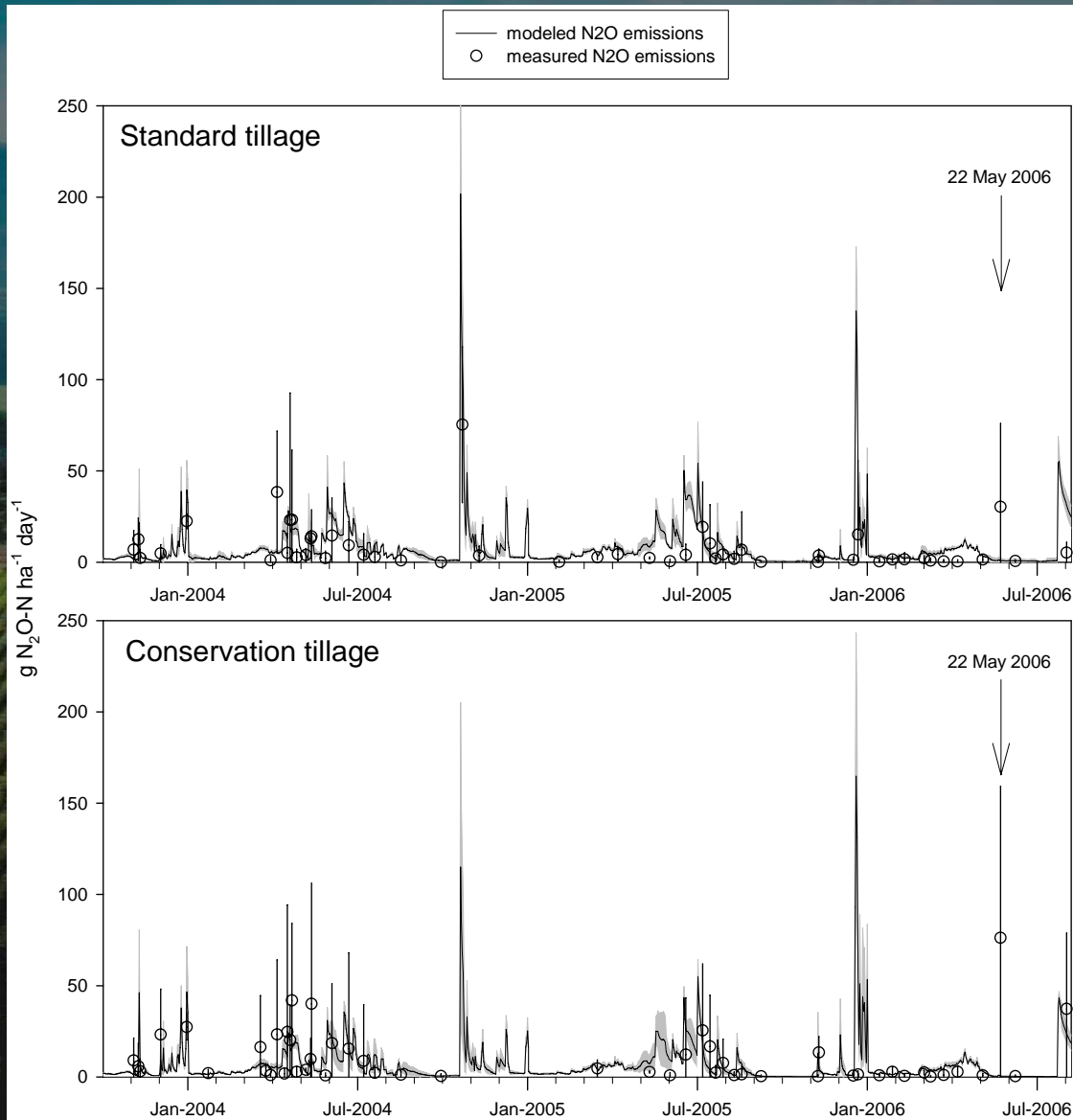
Site validation

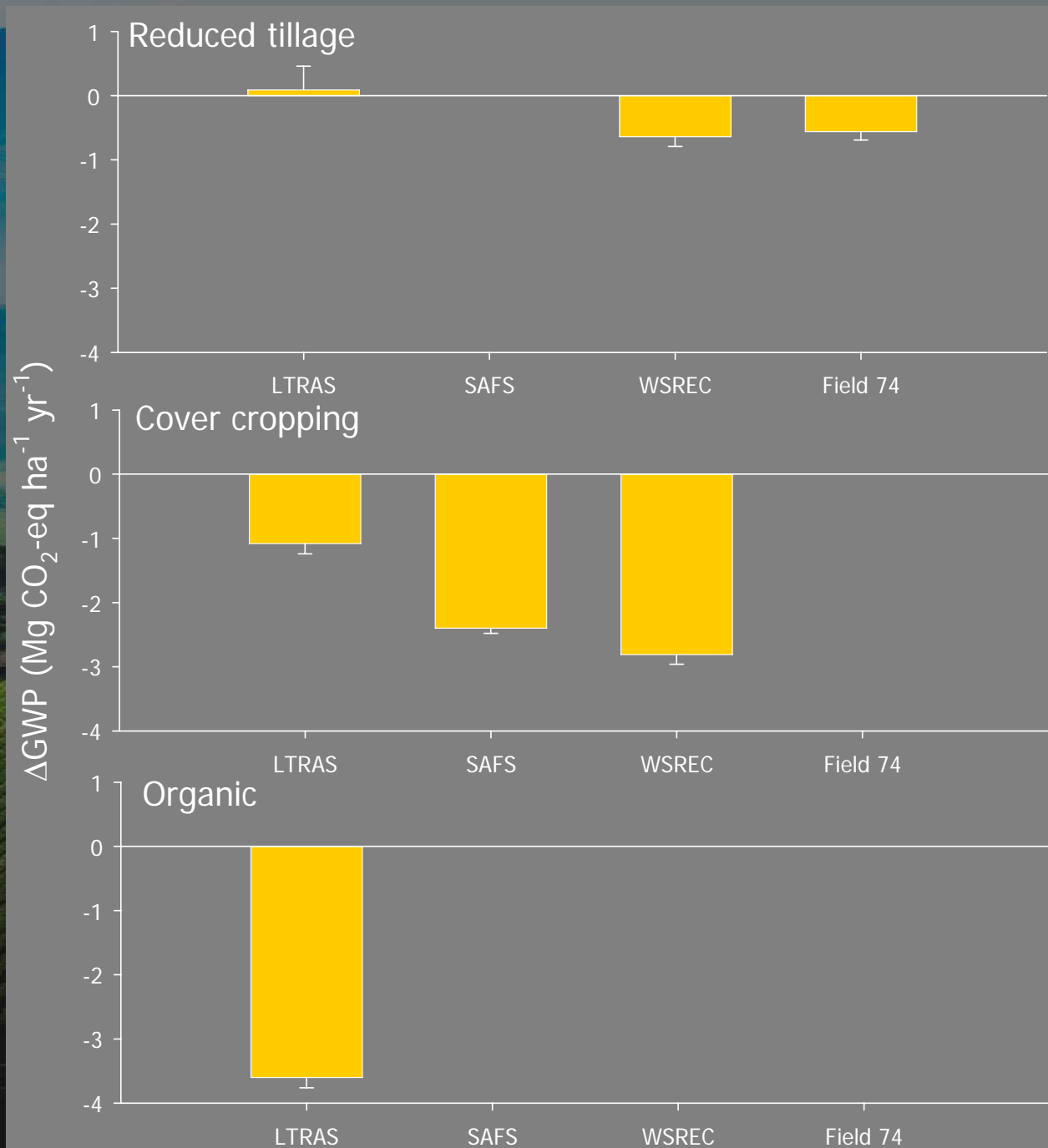


Site validation



Site validation

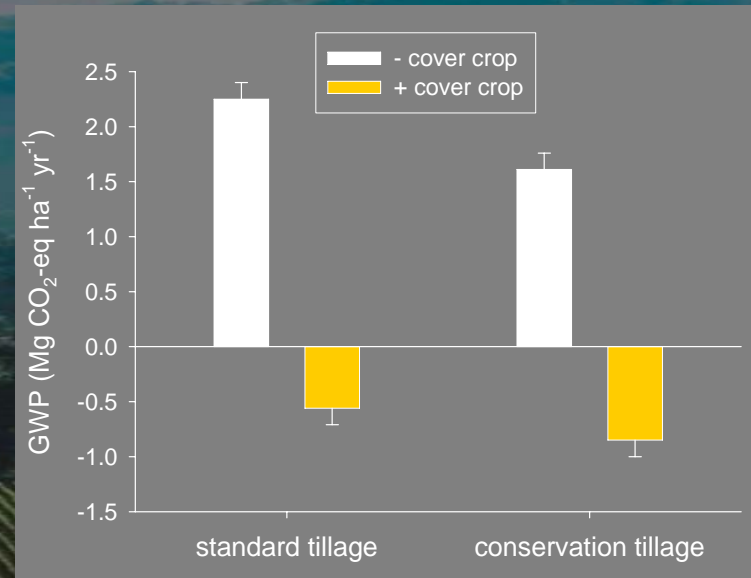




reductions in fuel use,
account for extra saving
of 0.25-0.50 Mg CO₂-eq
ha⁻¹ yr⁻¹

Site validation

- Reductions are not additional



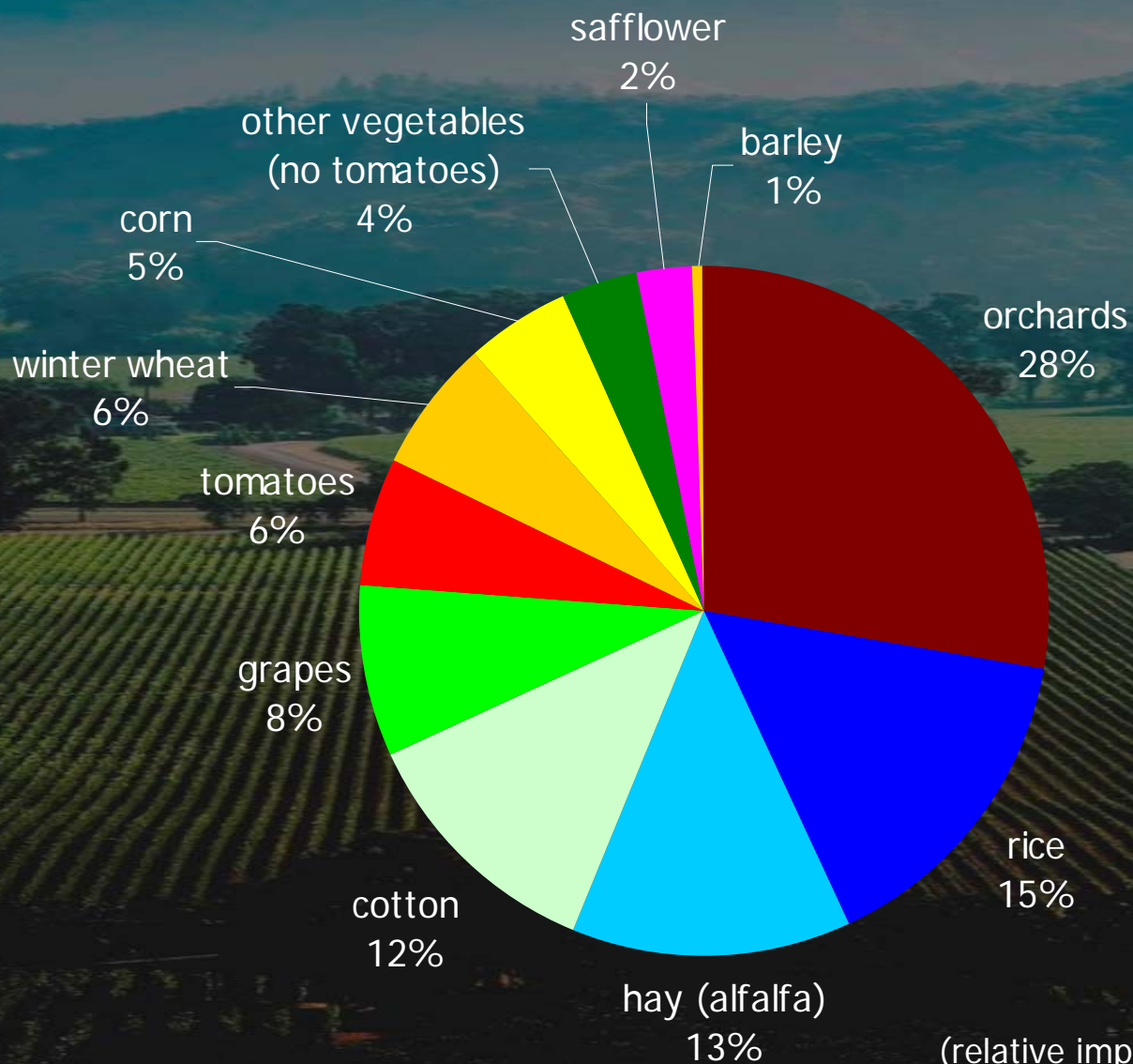
- Variance around estimates is mostly caused by differences in weather, rather than soil characteristics

Regional Scale

- 10 counties
 - 8 in Sacramento Valley
 - 2 in San Joaquin Valley

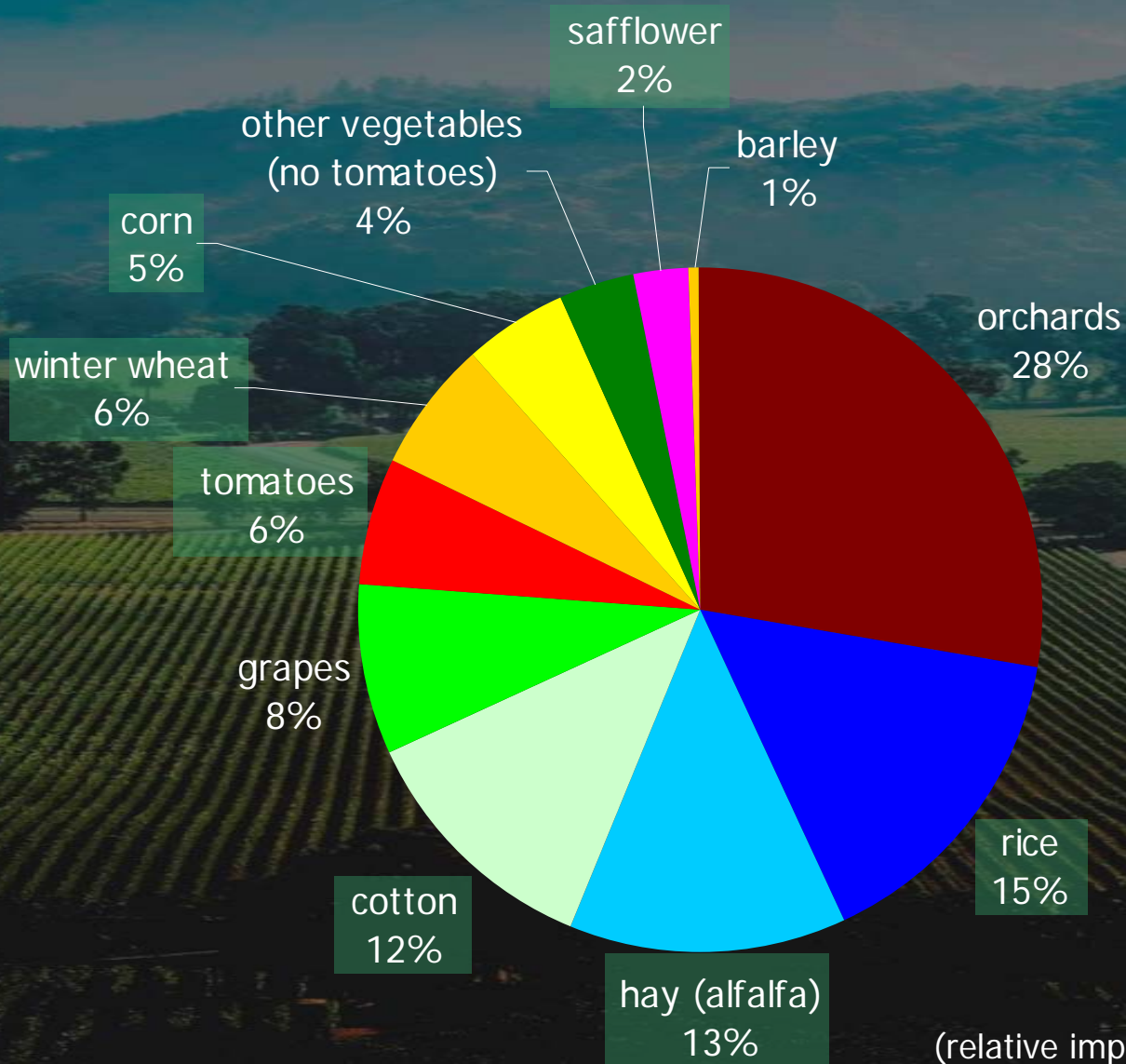


Regional Scale



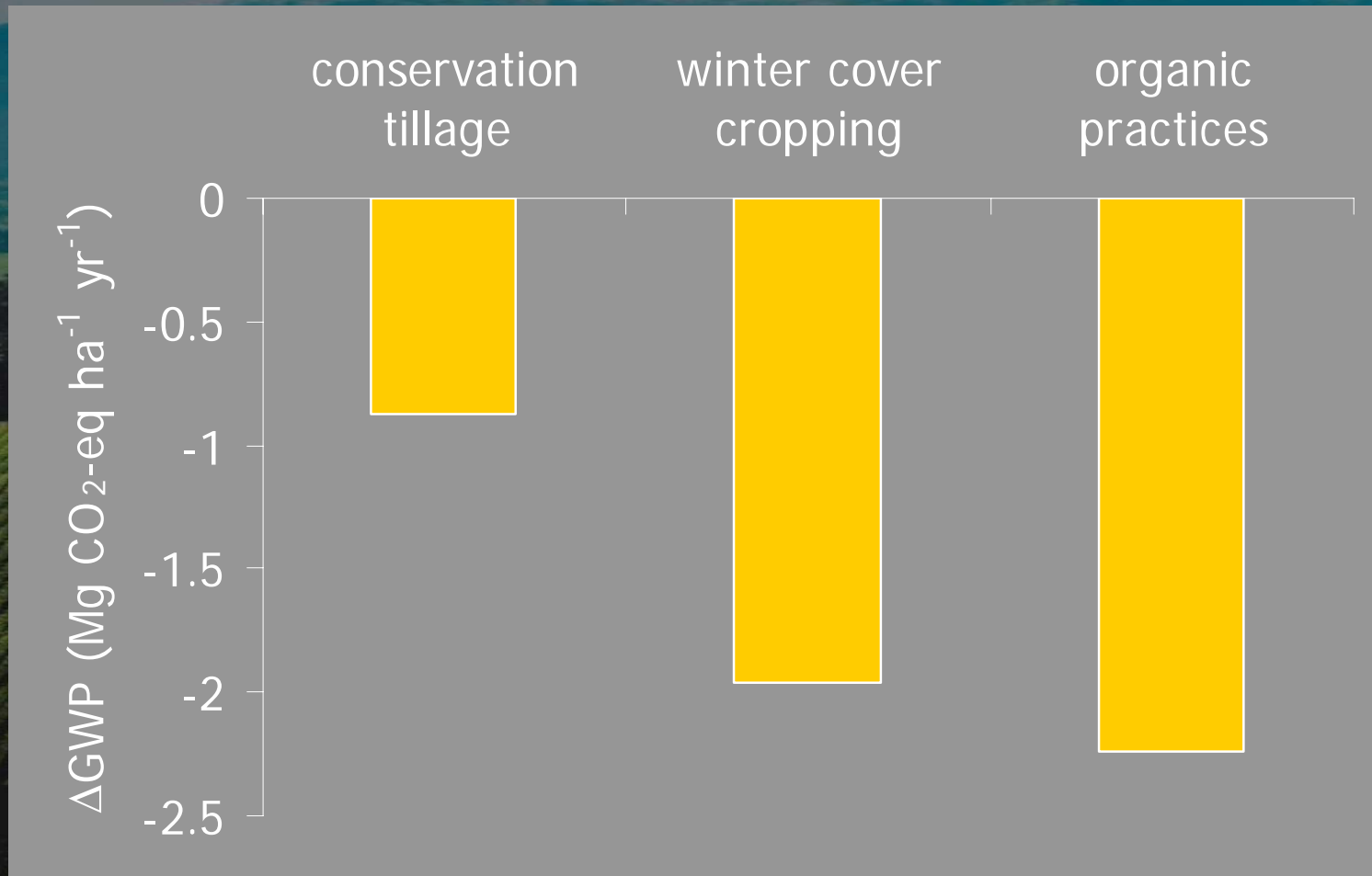
(relative importance of cropped areas)

Regional Scale



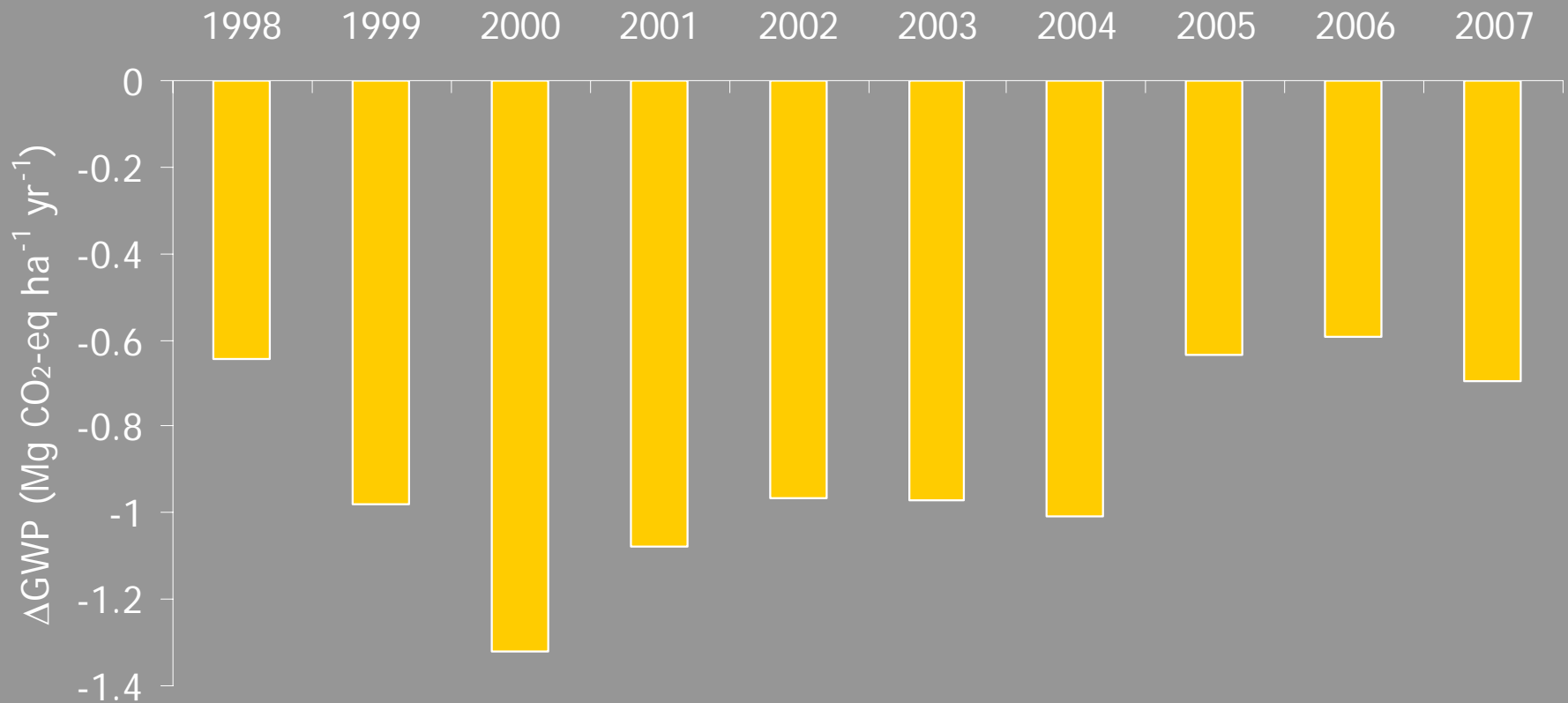
(relative importance of cropped areas)

Overall mitigation potentials



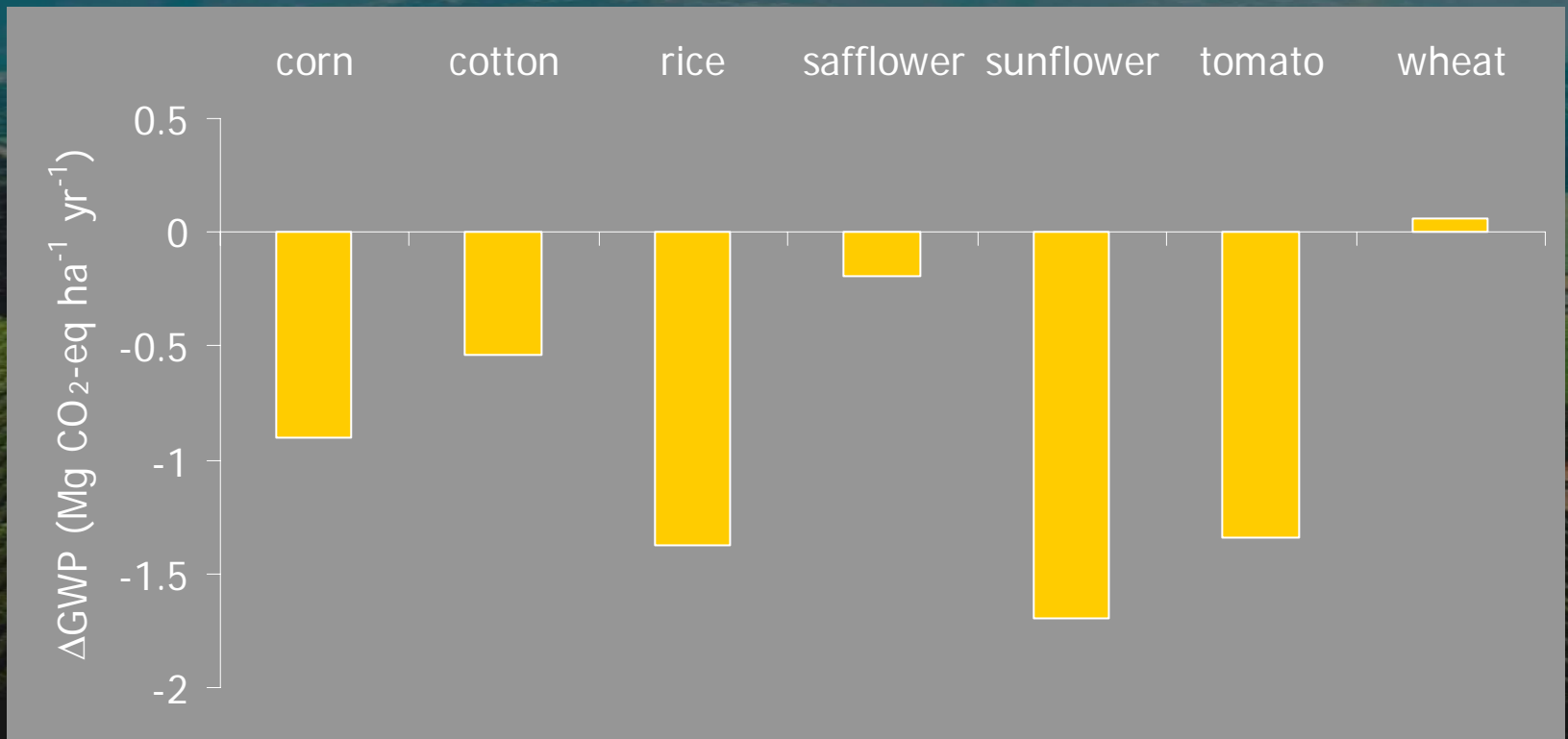
Time dependency

- For conservation tillage:

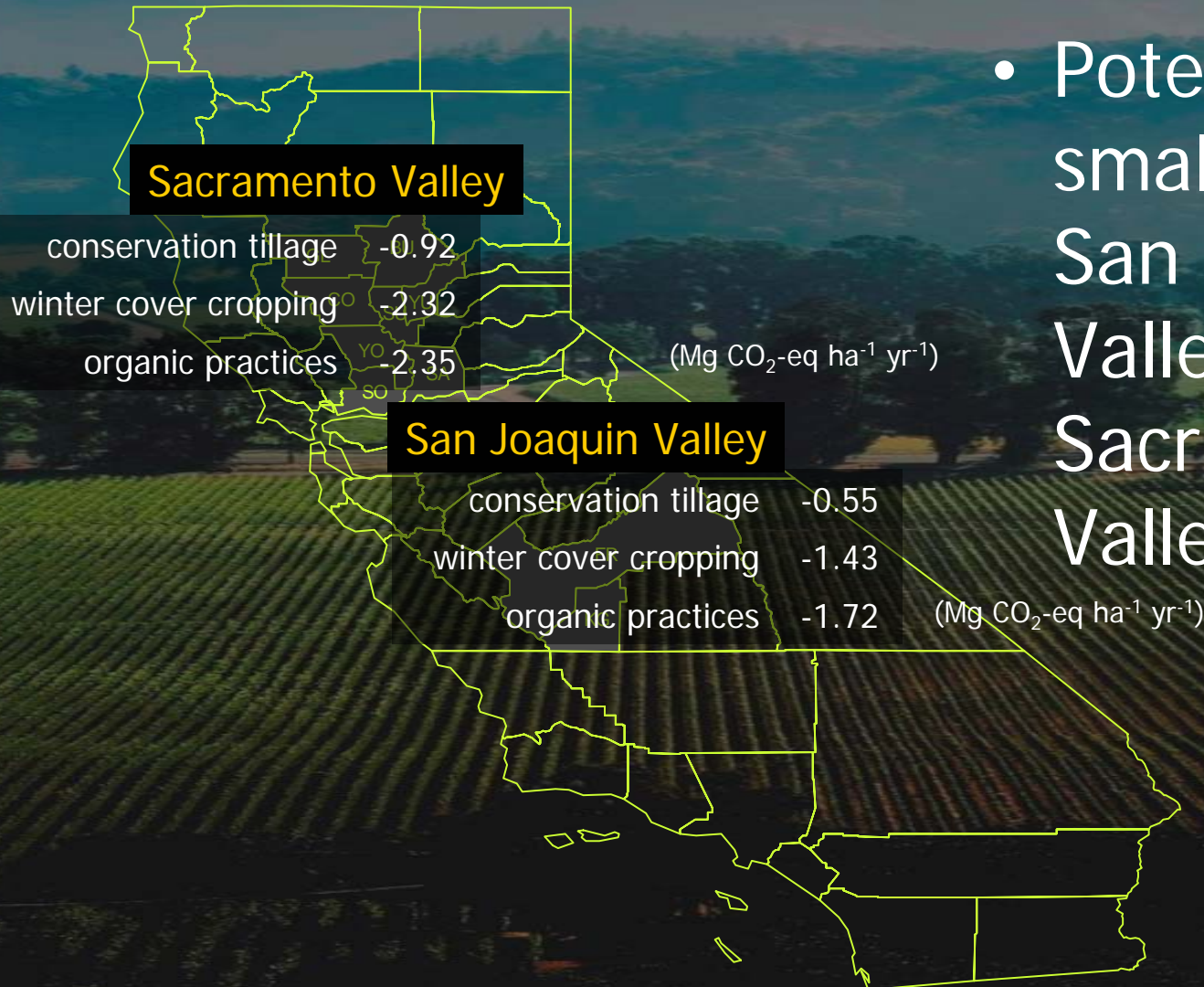


Variation among crops

- For reduced tillage:



Geographical differences



- Potentials smaller in the San Joaquin Valley than the Sacramento Valley

Conclusion

- Mitigation potentials: $1\text{-}2 \text{ Mg CO}_2\text{-e ha}^{-1} \text{ yr}^{-1}$
 $= 0.3\text{-}0.6 \text{ Mg C ha}^{-1} \text{ yr}^{-1}$
- Potential mitigation: conservation tillage < winter cover cropping < organic practices
- Conservation tillage might be most favorable
 - reduced fuel-C emissions are permanent
 - Easy to implement => economically favorable (see next presentation)

Acknowledgements

- Kearney Foundation
- California Energy Commission, PIER program